

Electrolytic Method for Tungsten Coating of Uranium Oxide Spheres, Phase I

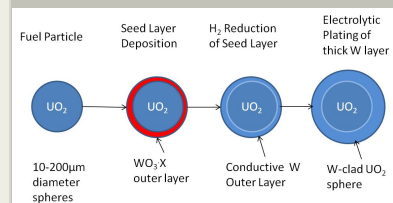
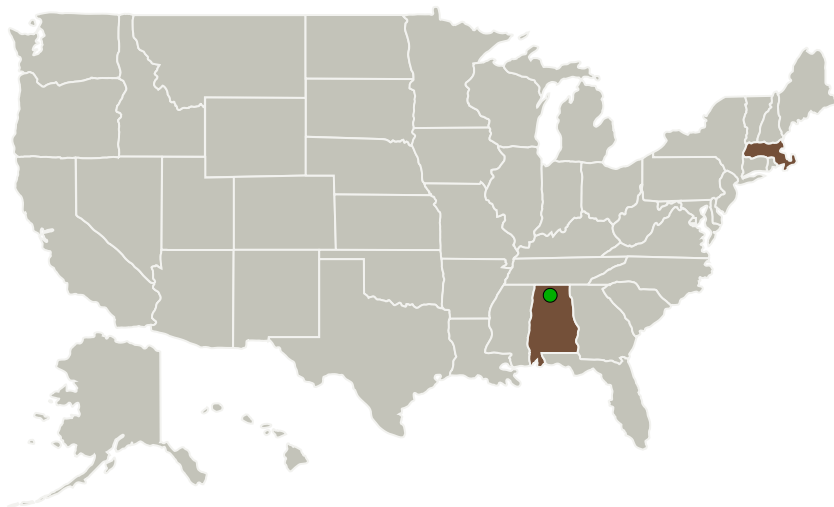
Completed Technology Project (2016 - 2016)



Project Introduction

Tungsten clad uranium dioxide spheres are deemed an enabling technology for nuclear thermal propulsion. Current research has mainly focused upon chemical vapor deposition (CVD) technologies to apply the tungsten cladding. Although good progress has been made with this technique, the process still requires improvements to lower the impurity content, increase throughput and lower operating cost. Reactive Innovations, LLC (RIL) proposes to develop an electrolytic process for coating high purity tungsten metal onto uranium dioxide spheres economically. The process is performed at ambient pressure and is expected to provide a uniform, dense, and adherent coating. The Phase I effort will lead to demonstrating the electrolytic deposition of tungsten onto surrogate spheres. The coating will be evaluated for thickness, uniformity, and adhesion. A manufacturing cost model will be established for the process and a pathway to large scale economic production will be outlined. The Phase II effort is envisioned to further improve and characterize the coating's properties in terms of process capability, evaluate coated spheres in a suitable hydrogen environment, perform thermal cycling tests, scale the fabrication process, and provide coated material to NASA for evaluation.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Reactive Innovations, LLC	Lead Organization	Industry	Westford, Massachusetts
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Transitions

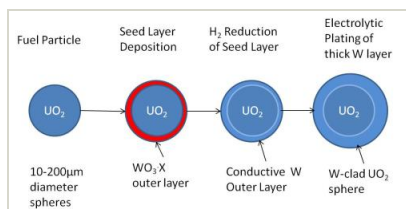
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139791>)

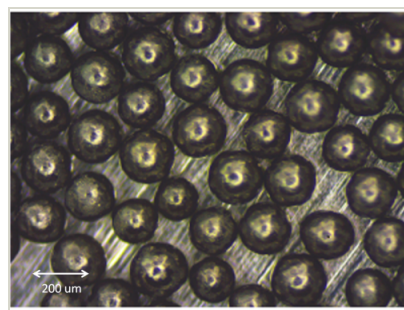
Images



Briefing Chart Image

Electrolytic Method for Tungsten Coating of Uranium Oxide Spheres, Phase I

(<https://techport.nasa.gov/image/131193>)



Final Summary Chart Image

Electrolytic Method for Tungsten Coating of Uranium Oxide Spheres, Phase I Project Image
(<https://techport.nasa.gov/image/132328>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Reactive Innovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

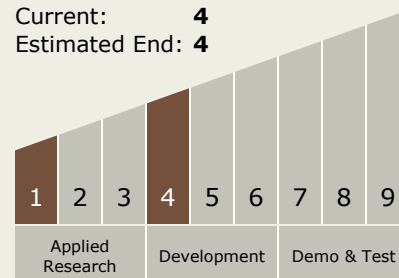
Carlos Torrez

Principal Investigator:

Edward Salley

Technology Maturity (TRL)

Start: **1**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.4 Advanced Propulsion
 - └ TX01.4.3 Nuclear Thermal Propulsion

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System